AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings of claims in the application:

LISTING OF CLAIMS:

1)(original) Portable self-contained electric power tool such as for example pruning shears, chainsaw, fruit collecting tool, lawnmower with wires, jackhammer or the like, comprising at least three separate functional subassemblies, namely a first subassembly forming an electrical actuator and generating the mechanical action of the tool, a second subassembly forming an electric energy source and comprising essentially a rechargeable electrochemical battery and a third subassembly forming a charger adapted to carry out controlled recharging of the battery, characterized in that:

the second subassembly (3) is portable by the operator and is constituted on the one hand by a lithium ion or lithium polymer electrochemical battery (5) formed by association of more than four cells (6) in series, each cell being comprised by one or several elements in parallel and, on the other hand, by a command and control module (7) for the battery (5), preferably in the form of an electronic device located in immediate adjacency to said battery (5) and ensuring over time and in a controlled manner a maximum capacity of the battery and an optimum use of the tool;

the first subassembly (2) is subjected during its operation to control by a system (8) of current limitation adapted to reserve the lithium ion or lithium polymer electrochemical battery (5) from which it draws energy; the third subassembly (4) consists at least in a source of electrical supply whose voltage and current are suitable to recharging the lithium ion or lithium polymer battery (5).

2)(original) Electrical tool assembly according to claim 1, characterized in that the electronic control and command module (7) of the battery (5) of the second subassembly (3) is present in the form of an electronic card and comprises at least one digital processing unit (9), such as for example a microprocessor, a microcontroller, a digital signal processor, associated with a memory and with annexed circuits, adapted together to perform at least certain, and preferably all, of the following group of tasks comprised by:

management of the charge,

management of the discharge,

balancing the charge of each cell (6),

evaluation and display of the capacity of the battery (5),

protection in discharge of the battery (5) as to excess current during use of the tool,

management of the tool during storage phases,

management of alarms,

management and transmission of collected information,

management of the diagnostics.

3)(original) Electrical tool assembly according to claim 2, characterized in that, for the accomplishment of the tasks of management of the charge, of management of the discharge, balancing of the charge of each cell (6), evaluation and display of the capacity of the battery (5), the command and control module (7) permanently uses the values of measurement of the voltage of each cell (6) comprising the battery (5).

4)(original) Electrical tool assembly according to claim 3, characterized in that, for a battery (5) formed of n cells (6) in series, the values of measurement of the voltage of each cell (6) are provided by an electronic acquisition channel (10) constituted principally of n identical analog modules (11),

mounted respectively at the terminals of n cells (6) of the battery (5) and adapted to measure the voltage of the respectively corresponding cell (6), the values of voltage measured by each of the n modules (11) being then routed, one after the other, by means of at least one analog multiplexer (12) and after amplification by a suitable circuit (13) toward an analog/digital input converter (9') of the digital processing unit (9) forming a portion of the command and control module (7).

5) (original) Electrical tool assembly according to claim 4, characterized in that the analog modules (11) for measurement of voltage perform respectively for each cell (6) a subtraction between the voltage measured at its positive terminal and the voltage measured at its negative terminal, this by means of a differential electronic assembly with an operational amplifier (11') using resistances (11'') for resistive input elements.

6) (original) Electrical tool assembly according to claim 5, characterized in that the electronic differential assembly with operational amplifier (11') of each voltage measuring module (11) comprises resistances or resistive input elements (11'') of an impedance of about or greater than 1 Mohm so as to obtain very low loss currents and for example less than $1/20000^{th}$ per hour of the total capacity of the battery (5).

7) (currently amended) Electrical tool assembly according to ~~claims 3 to 6~~ claim 3, characterized in that the values of measurement of the voltage of each cell (6) are delivered with a precision of measurement of at least 50 mV.

8) (original) Electrical tool assembly according to claim 7, characterized in that the precision of measurement of the voltage of at least 50 mV is obtained by calibration during production of

the electronic card of the command and control module of the battery (7).

9) (original) Electrical tool assembly according to claim 8, characterized in that the calibration during manufacture of the electronic card consists in introducing by programming into the digital processing unit (9), for each module of voltage measurement (11), parameters for correcting errors as a function of the measurement of one or several very precise reference voltages, that are substituted for this calibrating operation for the normal voltages measured at the terminals of each cell (6).

10) (currently amended) Electrical tool assembly according to ~~any one of claims 2 to 9~~ claim 2, characterized in that the task of balancing the charge of the cells (6) relative to each other is managed by the digital processing unit (9) which controls based on the values of measurement of voltage of each cell (6), and if necessary for each of them, the development of the charge current by means of dissipater circuits based on electronic switches (14) associated with resistive elements (14').

11) (currently amended) Electrical tool assembly according to ~~any one of claims 2 to 10~~ claim 2, characterized in that the task of managing the discharge consists in continuously scrutinizing the voltage data of each cell (6) by means of the digital processing unit (9), in interrupting the discharge when the latter detects that one of the voltages of the cell (6) has reached the minimum discharge threshold set by the producer of lithium ion or lithium polymer elements and in cutting the discharge by deactivating a switching component (15) of the discharge, thereby leading to stopping the tool (2) and by activating, for example, a sonic or visual alarm.

12) (currently amended) Electrical tool assembly according to ~~any one of claims 2 to 11~~ claim 3, characterized in that the tasks of managing the charge, of evaluating and displaying the capacity of the battery (5) and of protection from over-voltage during discharge, are managed continuously by the digital processing unit (9) thanks to an analog electronic circuit (16) for measurement of the current of the charge and discharge of the battery (15).

13) (original) Electrical tool assembly according to claim 12, characterized in that during the task of managing the charge, whilst the third subassembly forming a charger (4) is connected to the second subassembly (3) at the electronic card of the command and control module (7) of the battery (5), the end of the charge is obtained by opening the switching component of the charge (17) which is controlled by the digital processing unit (9) when, on the one hand, said unit (9) detects by means of the digital electronic circuit (16) for measuring the charge and discharge current, a drop in the charge current to a predetermined threshold, for example 50 mA, for the battery (5) or that, on the other hand, the temperature of the battery (5) exceeds a permitted limit value, for example 55°C, or else that the charging is prolonged during a time greater than a given fraction of the theoretical charge time, for example about 20%.

14) (currently amended) Electrical tool assembly according to claim 12, ~~when dependent from one of claims 3 to 9~~, characterized in that the task of evaluation and display of the capacity of the battery (5) is managed by the digital processing unit (9), this latter computing said capacity by taking into account continuously, during charge and during use of the tool, on the one hand, information as to the instantaneous current of the charge and discharge of the battery (5) delivered by the analog electronic circuit for measuring the current of charge and

discharge (16) and, on the other hand, the values of measurement of voltage of each cell (6) and, not necessarily but for more precise computation, their known mean internal resistance.

15) (currently amended) Electrical tool assembly according to ~~any one of claims 2 to 14~~ claim 2, characterized in that the task of protection from over-current during the discharge of the battery (5) during use of the tool, adapted to preserve the lithium ion or lithium polymer battery from premature aging or from exaggerated heating, consists either in cutting the discharge current in the case of very large impulsional exceeding of the maximum discharge current for the battery (5) or by exceeding the maximum limit temperature permitted for this latter, or by limiting the discharge current as a function of the energy consumed by the tool during a certain running time, given that the value of the energy of the running time is predetermined experimentally as a function of the tool, of it use and of the desired lifetime for the lithium ion or lithium polymer battery (5) forming a portion of the second subassembly (3).

16) (original) Electrical tool assembly according to claim 15, characterized in that the limitation of discharge current is managed by the unit (9) for digital processing by applying a command for modulation of impulse width (MLI), generated either directly by said unit (9), or by a specialized component, or by means of a piloting stage (18), with a switching component of the discharge (15) provided for example in the form of a component of the MOSFET channel N type.

17) (currently amended) Electrical tool assembly according to ~~any one of claims 2 to 16~~ claim 2, characterized in that, when it is not charging and has not been used for a predetermined period, for example 10 days, the digital processing unit (9) automatically performs a task of management of storage which

consists in verifying whether the residual capacity of the battery (5) is greater or not than the storage capacity predetermined by the manufacturer or lithium ion or lithium polymer elements and, if the residual capacity is substantially superior to the storage capacity, in triggering by the digital processing unit (9) an automatic discharge of the battery with the help of resistive circuits (14, 14') connected in parallel with each cell (6), this until the storage capacity is reached, and then stopping all the electronic circuits whilst placing the processing unit (9) is standby in low consumption mode and, if the capacity is below the storage capacity, in triggering by the digital processing unit (9) a sonic and/or visual alarm.

18) (currently amended) Electrical tool assembly according to ~~any one of claims 2 to 17~~ claim 2, characterized in that the digital processing unit (9) is adapted to detect the connection of the charger (4) under voltage to the battery (5) by means of a voltage measurement by the command and control module (7) at at least one of the terminals (20) of the second subassembly (3) adapted to be connected to said charger (4).

19) (original) Electrical tool assembly according to claim 18, characterized in that the function of detection of the connection of the charger (4) under voltage to the battery (5) is carried out by means of a particular suitable measuring circuit (19), permitting, while the tool is stored in non-use phase, by detecting the instant at which at least one cell (6) achieves the minimum voltage set by the manufacturer, thereby to trigger an automatic recharge of the battery (5).

20) (currently amended) Electrical tool assembly according to claim 18 [[or 19]], characterized in that when the command and control module (7) detects an excessive or insufficient voltage of the charger (4) at the corresponding connection terminals (20)

of the second subassembly (3), the digital processing unit (9) which uses this information commands the stopping of charging and triggers a sonic and/or visual alarm.

21) (currently amended) Electrical tool assembly according to ~~any one of claims 2 to 20~~ claim 2, characterized in that the task of managing the information and diagnostics consists in storing in the memory of the digital process unit (9) information acquired during the use of the tool such as for example: the number of recharges, the total of the hours of use of the tool, the development of the capacity of the battery (5) with time, the mean energy consumed by the tool or the like, this information being adapted to be transmitted by means of a wire connection (23), radio frequency of infrared toward a separate exploitation terminal, for example of the personal computer type, electronic personal assistant, GSM, being if desired connected to the Internet.

22) (currently amended) Electrical tool assembly according to ~~any one of claims 2 to 21~~ claim 2, characterized in that the command and control module (7) of the battery (5) forming a portion of the second subassembly (3) forming a source of rechargeable electrical energy is associated with the electronic command and control module of the actuator (2) on the same electronic card, as the case may be with the use of the same digital processing unit (9).

23) (currently amended) Electrical tool assembly according to ~~any one of claims 1 to 21~~ claim 1, characterized in that the electronic command and control module (7) of the battery (5) comprises for each cell (6) redundant security circuits for stopping charging (21), adapted to control each individually, in case of over-voltage of a cell (6), the general stopping of the

charge by deactivating directly a switching component (17) for the charge without disturbing the digital processing unit (9).

24) (currently amended) Electrical tool assembly according to claim 12 ~~or any one of claims 13 to 23 when dependent from claim 12~~, characterized in that the electronic command and control module (7) comprises a redundant circuit for stopping discharge (21'), adapted to control the stopping of discharge in the case of detection of a discharge current equal to or greater than a maximum admissible value for the battery (5) by the analog electronic measuring circuit (16), by directly deactivating the switching component (15) of the discharge without disturbing the digital processing unit (9).

25) (currently amended) Electrical tool assembly according to ~~any one of claims 1 to 24~~ claim 1, characterized in that the third subassembly (4) forming a charger adapted to recharge the lithium ion or lithium polymer battery (5) generates a voltage with a precision of about 0.5% and a regulated current, obtained by means of a specialized circuit for regulation of voltage and current.

26) (currently amended) Electrical tool assembly according to ~~any one of claims 1 to 25~~ claim 1, characterized in that each functional subassembly (2, 3 and 4) is mounted in a protective housing and/or a grippable housing, which can be connected together two by two by flexible deconnectable cables (22, 22') for the transfer of energy and the transmission of command and/or control signals between said subassemblies (2, 3, 4).